Information about GB Non-native Species Risk Assessments

The Convention on Biological Diversity (CBD) emphasises the need for a precautionary approach towards non-native species where there is often a lack of firm scientific evidence. It also strongly promotes the use of good quality risk assessment to help underpin this approach. The GB risk analysis mechanism has been developed to help facilitate such an approach in Great Britain. It complies with the CBD and reflects standards used by other schemes such as the Intergovernmental Panel on Climate Change, European Plant Protection Organisation and European Food Safety Authority to ensure good practice.

Risk assessments, along with other information, are used to help support decision making in Great Britain. They do not in themselves determine government policy.

The Non-native Species Secretariat (NNSS) manages the risk analysis process on behalf of the GB Programme Board for Non-native Species. Risk assessments are carried out by independent experts from a range of organisations. As part of the risk analysis process risk assessments are:

- Completed using a consistent risk assessment template to ensure that the full range of issues recognised in international standards are addressed.
- Drafted by an independent expert on the species and peer reviewed by a different expert.
- Approved by an independent risk analysis panel (known as the Non-native Species Risk Analysis Panel or NNRAP) only when they are satisfied the assessment is fit-for-purpose.
- Approved for publication by the GB Programme Board for Non-native Species.
- Placed on the GB Non-native Species Secretariat (NNSS) website for a three month period of public comment.
- Finalised by the risk assessor to the satisfaction of the NNRAP.

To find out more about the risk analysis mechanism go to: www.nonnativespecies.org

Common misconceptions about risk assessments

To address a number of common misconceptions about non-native species risk assessments, the following points should be noted:

- Risk assessments consider only the risks posed by a species. They do not consider the practicalities, impacts or other issues relating to the management of the species. They therefore cannot on their own be used to determine what, if any, management response should be undertaken.
- Risk assessments are about negative impacts and are not meant to consider positive impacts that may also occur. The positive impacts would be considered as part of an overall policy decision.
- Risk assessments are advisory and therefore part of the suite of information on which policy decisions are based.
- Completed risk assessments are not final and absolute. Substantive new scientific evidence may prompt a re-evaluation of the risks and/or a change of policy.

Period for comment

Draft risk assessments are available for a period of three months from the date of posting on the NNSS website*. During this time stakeholders are invited to comment on the scientific evidence which underpins the assessments or provide information on other relevant evidence or research that may be available. Relevant comments are collated by the NNSS and sent to the risk assessor. The assessor reviews the comments and, if necessary, amends the risk assessment. The final risk assessment is then checked and approved by the NNRAP.

*risk assessments are posted online at:
https://secure.fera.defra.gov.uk/nonnativespecies/index.cfm?sectionid=51
comments should be emailed to nnss@fera.gsi.gov.uk

GB NON-NATIVE ORGANISM RISK ASSESSMENT SCHEME

For more information visit: www.nonnativespecies.org

	Name of Organism:	**Marsh frog - *Pelophylax ridibundus.***
	Objectives:	Assess the risks associated with this species in GB
	Version:	FINAL 30/3/11

N	QUESTION	RESPONSE	COMMENT
1	What is the reason for performing the Risk Assessment?		Marsh frogs have been established in several populations in south-east England since the last half of the twentieth century (Smith, 1973; Beebee and Griffiths, 2000). However, more recently established populations have been detected elsewhere in England (Wycherley, 2003).
2	What is the Risk Assessment area?	England and Wales.	Populations have been present in south-east England in since 1935 onwards. However, more recently established populations have been reported elsewhere in England (Wycherley, 2003). There are no known populations in
3	Does a relevant earlier Risk Assessment exist?	NO OR UNKNOWN (Go to 5)	
4	If there is an earlier Risk Assessment is it still entirely valid, or only partly valid?		
A	**Stage 2: Organism Risk Assessment SECTION A: Organism Screening**		
5	Identify the Organism. Is the organism clearly a single taxonomic entity and can it be adequately distinguished from other entities of the same rank?	YES (Give the full name & Go to 7)	*Pelophylax ridibundus* , Pallas 1771, formerly *Rana ridibunda* (Frost *et al.* , 2006).
6	If not a single taxonomic entity, can it be redefined?		
7	Is the organism in its present range known to be invasive, i.e. to threaten species, habitats or ecosystems?	YES (Go to 9)	Marsh frogs have been introduced to Belgium, France, Italy, Spain and Switzerland (Lanza, 1962; Guyetant, 1986; Arano *et al.* , 1995; Scalera, 2007, Schmeller *et al.* , 2007; Holsbeek *et al.* , 2008) where they threaten the genetic integrity of native water frogs, through interbreeding.
8	Does the organism have intrinsic attributes that indicate that it could be invasive, i.e. threaten species, habitats or ecosystems?	YES or UNCERTAIN (Go to 9)	In common with many pond breeding amphibians, the Marsh frog produces large numbers of eggs (Lever, 1977). It is capable of relatively long-distance dispersal, compared with other pond-breeding amphibians. Both of these attributes may assist rapid colonisation of suitable habitat. It feeds on a wide variety of prey species (Smith, 1953) and, because it is a relatively large frog, it is potentially capable of preying on the native amphibians (e.g. Beebee and Griffiths, 2000). This species is, however, a native of continental Europe (predominantly eastern) and so has evolved in the same geographic range as many native species, and coexistence within this range occurs (Gasc *et al* ., 1997).
9	Does the organism occur outside effective containment in the Risk Assessment area?	YES (Go to 10)	See Wycherley (2005) for a review.
10	Is the organism widely distributed in the Risk Assessment area?	NO (Go to 11)	In reality this species is widely distributed in the Risk Assessment area. However, it is unlikely to have reached the limits of its range, so 'NO' has been selected as a more appropriate option.
11	Does at least one species (for herbivores, predators and parasites) or suitable habitat vital for the survival, development and multiplication of the organism occur in the Risk Assessment area, in the open, in protected conditions or both?	YES (Go to 12)	The Marsh frog is a generalist predator, so there are abundant potential prey species within the Risk Assessment Area. It is a highly aquatic species which, in the northern part of its range, prefers larger water bodies in lowland areas (Gasc *et al.* , 1997). These habitats are abundant in the Risk Assessment Area.
12	Does the organism require another species for critical stages in its life cycle such as growth (e.g. root symbionts), reproduction (e.g. pollinators; egg incubators), spread (e.g. seed dispersers) and transmission, (e.g. vectors)?	NO (Go to 14)	
13	Is the other critical species identified in question 12 (or a similar species that may provide a similar function) present in the Risk Assessment area or likely to be introduced? If in doubt, then a separate assessment of the probability of introduction of this species may be needed.		
14	Does the known geographical distribution of the organism include ecoclimatic zones comparable with those of the Risk Assessment area or sufficiently similar for the organism to survive and thrive?	YES (Go to 16)	The extensive range in Europe and across Asia includes some ecoclimatic zones that are similar to the Risk Assessment area.
15	Could the organism establish under protected conditions (e.g. glasshouses, aquaculture facilities, terraria, zoological gardens) in the Risk Assessment area?	YES (Go to 16)	Marsh frog populations in England are often associated with fish holding establishments and so there is potential for establishment in aquaculture facilities (Wycherley, 2003).
16	Has the organism entered and established viable (reproducing) populations in new areas outside its original range, either as a direct or indirect result of man's activities?	YES (Go to 17)	The Marsh frog has been introduced beyond its natural range by deliberate introduction to Belgium, England, France, Italy, Spain and Switzerland, for culture/human consumption (Guyetant, 1986; Arano *et al.* , 1995; Scalera, 2007, Schmeller *et al* ., 2007).

17	Can the organism spread rapidly by natural means or by human assistance?	YES (Go to 18)	Spread by natural means appears to be rapid (by amphibian standards), where favourable habitat is present (approximately half a mile per year [Menzies, 1962]). The initial introduction to England involved a small number of frogs that rapidly colonised Romney and Walland Marshes (Smith, 1949; Menzies, 1962; Smith, 1964). Spread has also been rapid in France (Pagano *et al.* , 2001). Spread by humans (secondary introductions within the UK) was initially slow, but appears to have become more rapid in recent years, possibly due to climatic change (warmer summers) (Wycherley, 2003).
18	Could the organism as such, or acting as a vector, cause economic, environmental or social harm in the Risk Assessment area?	YES OR UNCERTAIN (Go to 19)	
19	This organism could present a risk to the Risk Assessment area and a detailed risk assessment is appropriate.	Detailed Risk Assessment Appropriate GO TO SECTION B	
20	This organism is not likely to be a harmful non-native organism in the Risk Assessment area and the assessment can stop.		

B	SECTION B: Detailed assessment of an organism's probability of entry, establishment and spread and the magnitude of the economic, environmental and social consequences			
	Probability of Entry	**RESPONSE**	**UNCERTAINTY**	**COMMENT**
1.1	List the pathways that the organism could be carried on. How many relevant pathways can the organism be carried on?	few - 1	MEDIUM -1	Unintentional introduction: Transported commodities in commerce/international freight. Note that the main pathway of entry to other European counties has been for purposes of human consumption either intentional or as an unintentional escape from farming activities. This latter pathway is unlikely to be relevant to the Risk Assessment area.
1.2	Choose one pathway from the list of pathways selected in 1.1 to begin the pathway assessments.	A1 Unintentional introduction: Transported commodities in commerce/international freight.		Recently established populations in England are often associated with fisheries activities (fish farms or angling lakes). It seems likely that these populations were established by frog tadpoles being transported with fish. This may also be an international pathway. i.e. Marsh frog tadpoles may be imported with fish stocks from Europe (Wycherley, 2003). Information on the occurrence of Marsh frogs in European fish farms and transport of tadpoles with fish is scant. Hence, quantitive assessment of the probability of entry of this pathway is impossible.
1.3	How likely is the organism to be associated with the pathway at origin?	moderately likely - 2	HIGH -2	Marsh frogs presumably breed in some fish farms in continental Europe, which export fish to the Risk Assessment area.
1.4	Is the concentration of the organism on the pathway at origin likely to be high?	moderately likely - 2	HIGH -2	
1.5	How likely is the organism to survive existing cultivation or commercial practices?	likely - 3	MEDIUM -1	
1.6	How likely is the organism to survive or remain undetected by existing measures?	likely - 3	MEDIUM -1	There are few controls in place (Wycherley, 2003).
1.7	How likely is the organism to survive during transport /storage?	moderately likely - 2	LOW - 0	There is no information available regarding survival rates in transit, but some individuals must survive.
1.8	How likely is the organism to multiply/increase in prevalence during transport /storage?	very unlikely - 0	LOW - 0	Conditions of transport are not conducive to reproduction by Marsh frogs.
1.9	What is the volume of movement along the pathway?	minimal - 0	HIGH -2	
1.10	How frequent is movement along the pathway?	rarely - 1	HIGH -2	It is assumed that this is an unusual occurrence.
1.11	How widely could the organism be distributed throughout the Risk Assessment area?	widely - 3	HIGH -2	Assuming that this question considers how widely the organism could become, then assume widely, because recently established populations are scattered over a large range.
1.12	How likely is the organism to arrive during the months of the year most appropriate for establishment ?	moderately likely - 2	LOW - 0	
1.13	How likely is the intended use of the commodity (e.g. processing, consumption, planting, disposal of waste, by-products) or other material with which the organism is associated to aid transfer to a suitable habitat?	likely - 3	HIGH -2	Fish stocks are likely to be released into habitat that is suitable for the survival of Marsh frog tadpoles.
1.14	How likely is the organism to be able to transfer from the pathway to a suitable habitat?	likely - 3	HIGH -2	As above.

	Probability of Establishment	RESPONSE	UNCERTAINTY	COMMENT
1.15	How similar are the climatic conditions that would affect establishment in the Risk Assessment area and in the area of current distribution?	moderately similar - 2	MEDIUM -1	Note that climate change appears to be favouring the successful establishment of populations (Wycherley, 2003).
1.16	How similar are other abiotic factors that would affect establishment in the Risk Assessment area and in the area of present distribution?	similar - 3	MEDIUM -1	The Marsh frog is a relatively aquatic amphibian, preferring larger water bodies in lowland areas. Such habitat is abundant in the Risk Assessment area.
1.17	How many species (for herbivores, predators and parasites) or suitable habitats vital for the survival, development and multiplication of the organism species are present in the Risk Assessment area? Specify the species or habitats and indicate the number.	many - 3	LOW - 0	The Marsh frog appears to be a generalist predator, taking a wide range of aquatic and terrestrial invertebrates and small vertebrates (Smith, 1953; Menzies, 1962, Ruchin and Ryzhov, 2002). Hence, there are abundant such prey species present in the Risk Assessment area. Large numbers of large water bodies that could provide habitat for the Marsh frog are present in lowland England and Wales. Coastal marshes and reedbeds also provide potential habitat for this species, which is more tolerant of salinity than native amphibians.
1.18	How widespread are the species (for herbivores, predators and parasites) or suitable habitats vital for the survival, development and multiplication of the organism in the Risk Assessment area?	widespread - 4	MEDIUM -1	Suitable prey species occur throughout the UK. Suitable habitats occur throughout lowland England and potentially lowland Wales.
1.19	If the organism requires another species for critical stages in its life cycle then how likely is the organism to become associated with such species in the risk assessment area?	N/A		
1.20	How likely is it that establishment will not be prevented by competition from existing species in the Risk Assessment area?	likely - 3	LOW - 0	The large size of the Marsh frog relative to other amphibians means that it is unlikely to be outcompeted by native amphibian species. Also, it often breeds in habitats not used by most native amphibians (e.g. large water bodies containing fish), reducing competitive interactions.
1.21	How likely is it that establishment will not be prevented by natural enemies already present in the Risk Assessment area?	likely - 3	LOW - 0	Natural predators will undoubtedly have an impact on this species, but it is unlikely that they will prevent establishment, as indicated by the recent establishment of populations in continental Europe and the UK (Wycherley, 2003; Scalera, 2007).
1.22	If there are differences in man's management of the environment/habitat in the Risk Assessment area from that in the area of present distribution, are they likely to aid establishment? (specify)	N/A	MEDIUM -1	It is difficult to summarise the management of large water bodies within the present distribution and the Risk Assessment area.
1.23	How likely is it that existing control or husbandry measures will fail to prevent establishment of the organism?	likely - 3	MEDIUM -1	There are no known control measures. Husbandry of fish stocks is unlikely to prevent the further establishment of the Marsh frog.
1.24	How often has the organism been recorded in protected conditions, e.g. glasshouses, elsewhere?	very rare - 0	HIGH -2	There are no known incidences.
1.25	How likely is the reproductive strategy of the organism and duration of its life cycle to aid establishment?	moderately likely - 2	HIGH -2	The Marsh frog produces 5 000 - 10 000 eggs (Lever, 1977), giving potential for rapid increases in population size, as occurred after the 1935 introduction in Kent (Smith, 1949).
1.26	How likely is it that the organism's capacity to spread will aid establishment?	moderately likely - 2	MEDIUM -1	The rate of dispersal of Marsh frogs from their introduction site in 1935 indicates that this species has relatively good dispersal abilities for an amphibian (approximately half a mile per year [Menzies, 1962]). The further spread of this species over the last 25 years is such that the Marsh frog has become thoroughly established in south-east England from a handful of introduction sites (Wycherley, 2003), demonstrating a capacity to spread .
1.27	How adaptable is the organism?	moderately adaptable - 2	MEDIUM -1	Large natural range and establishment outside of this range in six European countries and parts of Asia (Arano *et al.* , 1995; Scalera, 2007) suggest adaptability.
1.28	How likely is it that low genetic diversity in the founder population of the organism will not prevent establishment?	unlikely - 1	LOW - 0	Rapid population expansion from small numbers of population founders meant that no genetic bottlenecks have been detected in an examination of Marsh frogs in Romney, Kent, and Lewes, Sussex (Zeisset and Beebee, 2003).
1.29	How often has the organism entered and established in new areas outside its original range as a result of man's activities?	many - 3	HIGH -2	The Marsh frog has become established in six European countries and parts of Asia (Arano *et al* ., 1995 and review in Scalera, 2007), primarily for purposes of human consumption.
1.30	How likely is it that the organism could survive eradication campaigns in the Risk Assessment area?	likely - 3	MEDIUM -1	Eradication of this species in south-east England, where it is abundant, maybe in practical terms, impossible. However, eradication of smaller, more recently established populations elsewhere in England may be feasible.
1.31	Even if permanent establishment of the organism is unlikely, how likely is it that transient populations will be maintained in the Risk Assessment area through natural migration or entry through man's activities (including intentional release into the outdoor environment)?	N/A		Permanent establishment has occurred.

	Spread	RESPONSE	UNCERTAINTY	COMMENT
2.1	How rapidly is the organism liable to spread in the Risk Assessment area by natural means?	intermediate - 2	MEDIUM -1	Spread to new sites by natural means is likely to be slow. Habitat fragmentation by human development will hinder natural spread. However, if Marsh frogs reach a new area of suitable habitat, their spread through this is likely to be rapid, as has been the case in south-eastern England.
2.2	How rapidly is the organism liable to spread in the Risk Assessment area by human assistance?	intermediate - 2	MEDIUM -1	A review of water frogs in Britain concluded that movement to new areas occurred incidentally to the import of fish stocks from continental Europe (Wycherley, 2003). Presumably, transport of fish stocks within England constitute secondary introductions. These seem likely to cause the step-wise spread of Marsh frogs over relatively large distances.
2.3	How difficult would it be to contain the organism within the Risk Assessment area?	very difficult - 4	LOW - 0	The large introduced range makes this impractical.
2.4	Based on the answers to questions on the potential for establishment and spread define the area endangered by the organism.	Many wetland habitats within lowland England and possibly Wales.	MEDIUM -1	Wetland habitats include: rivers, large water bodies, reedbeds and marshes, especially coastal marshes.

	Impacts	RESPONSE	UNCERTAINTY	COMMENT
2.5	How important is economic loss caused by the organism within its existing geographic range?	minimal - 0	LOW - 0	There are no known economic losses.
2.6	Considering the ecological conditions in the Risk Assessment area, how serious is the direct negative economic effect of the organism, e.g. on crop yield and/or quality, livestock health and production, likely to be? (describe) in the Risk Assessment area, how serious is the direct negative economic effect of the organism, e.g. on crop yield and/or quality, likely to be?	minimal - 0	LOW - 0	There are no known economic losses to agricultural production. Although introduced populations are frequently associated with fisheries, significant losses of fish to frog predation are not apparent. The Marsh frog is a generalist predator, so even within fisheries, fish are unlikely to be a major dietary component.
2.7	How great a loss in producer profits is the organism likely to cause due to changes in production costs, yields, etc., in the Risk Assessment area?	minimal - 0	LOW - 0	There are no known losses to producer profits and these seem unlikely in the future.
2.8	How great a reduction in consumer demand is the organism likely to cause in the Risk Assessment area?	minimal - 0	LOW - 0	Not relevant, given that losses to production are highly unlikely.
2.9	How likely is the presence of the organism in the Risk Assessment area to cause losses in export markets?	very unlikely - 0	LOW - 0	Highly unlikely, given that no impacts on production have been identified.
2.10	How important would other economic costs resulting from introduction be? (specify)	minimal - 0	LOW - 0	No other economic costs likely to be incurred in the UK have been identified.
2.11	How important is environmental harm caused by the organism within its existing geographic range?	minimal - 0	HIGH -2	Environmental harm seems confined to 'genetic pollution'. Introduced Marsh frogs interbreed with other members of the water frog complex, disrupting the genetic integrity of native populations.
2.12	How important is environmental harm likely to be in the Risk Assessment area?	major - 3	MEDIUM -1	This is a difficult question to answer. Initial fears that the Marsh frog would displace native species, such as the Common frog, appear to have been unfounded (Buckley, 1986; Beebee and Griffiths, 2000; Lever, 2009). The global range of the Common frog has a large overlap with that of the Marsh frog. Although there is some habitat overlap, the two species have different habitat preferences and breed at different times of year. Although there may be some locations where Marsh frogs may have a competitive or predatory impact on Common frogs, it seems unlikely that the former will have a severe impact on the national population status of the latter. However, research in this area is needed to make better assessments.
2.13	How important is social and other harm caused by the organism within its existing geographic range?	minimal - 0	LOW - 0	This species calls loudly during late spring and early summer.
2.14	How important is the social harm likely to be in the Risk Assessment area?	minimal - 0	LOW - 0	Marsh frog calling has disturbed people in the UK (Lever, 2009), but such disturbance is likely to be localised and minor.
2.15	How likely is it that genetic traits can be carried to native species, modifying their genetic nature and making their economic, environmental or social effects more serious?	very likely - 4	LOW - 0	Interbreeding with native water frogs is a major problem posed by introduced populations of this species in continental Europe. However, this problem is less significant in the UK because of the scarcity of potential interbreeding species. The ongoing project to reintroduce the northern clade pool frog to England (Buckley and Foster, 2005) is the exception and could, potentially be harmed. Pool frogs and Marsh frogs generally occupy different habitats. However, should Marsh frogs become established in the current, or future, reintroduction sites for the northern clade pool frog, then hybridisation would be likely to occur, which would destroy the genetic integrity of the latter.
2.16	How probable is it that natural enemies, already present in the Risk Assessment area, will have no affect on populations of the organism if introduced?	unlikely - 1	HIGH -2	Not sure what this question hopes to establish. It is unlikely that predators in the Risk Assessment area will have 'no affect' on populations of the organism. However, it is more noteworthy that predators are unlikely to prevent the establishment of Marsh frogs if introduced (based on the success of recently established Marsh frog populations).
2.17	How easily can the organism be controlled?	with some difficulty - 2	MEDIUM -1	Control measures for this species have not, to my knowledge, been applied. However, given the large established range of the Marsh frog and the difficulties experienced in eradicating populations of another introduced large frog, the North American bullfrog, it seems likely that control of Marsh frogs will be similarly difficult.
2.18	How likely are control measures to disrupt existing biological or integrated systems for control of other organisms?	very likely - 4	LOW - 0	Control measures would be likely to involve draining breeding ponds during the tadpole stage (late spring to early autumn), which would be disruptive.
2.19	How likely is the organism to act as food, a host, a symbiont or a vector for other damaging organisms?	likely - 3	MEDIUM -1	Chytridiomycosis has adversely affected a range of amphibian species in different parts of the world (e.g. Berger *et al.* , 1998; Garner *et al.* , 2005). The pathogen, chytrid fungus, has a low host specificity; it has been found in all native amphibians (Cunningham and Minting, 2009; Peter Minting [pers. comm.]). The disease appears to be widespread in the UK, albeit at low rates of incidence. The impact of chytridiomycosis on native amphibians is unknown, so the degree of threat is unknown. There is an association between non-native amphibians and chytrid (Cunningham and Minting, 2009), but not specifically Marsh frogs. Given the generality of chytrid infection, it is likely that Marsh frogs are a vector of chytrid, but no more or less than native amphibians.
2.20	Highlight those parts of the endangered area where economic, environmental and social impacts are most likely to occur	East Anglia.	LOW - 0	Where pool frog reintroduction may be threatened.

Summarise Entry	very likely - 4	MEDIUM -1	Entry currently occurs primarily via importation of fish stocks (unintentional introductions, transported commodities in commerce/international freight). Deliberate release of Marsh frogs from the pet trade is also possible, but less likely (pets, collections and domestic animals [escape/release]).
Summarise Establishment	very likely - 4	LOW - 0	The Marsh frog is already established in the Risk Assessment area.
Summarise Spread	intermediate - 2	LOW - 0	Further spread across lowland England and possibly limited areas of Wales is likely, due to unintended, secondary introductions, and to natural spread in areas of suitable habitat.
Summarise Impacts	moderate - 2	MEDIUM -1	The predicted impact of establishment of the Marsh frog over much of the Risk Assessment area is minimal. No economic impacts are predicted and social impacts are negligible. Throughout most of the Risk Area, environmental impacts are likely to be minimal. Nevertheless, establishment of this frog in areas close to the site where the northern clade pool frog is currently being reintroduced, or to areas where further reintroduction may take place, could be catastrophic for this particular project.
Conclusion of the risk assessment	MEDIUM -1	MEDIUM -1	The Marsh frog is already present in the Risk Assessment area. Further secondary introductions via commercial movement of fish are likely. Range expansion is highly likely in response to climate change. The impacts of this range expansion are likely to be minimal except in East Anglia, where there is potential to undermine the re-establishment of the northern clade pool frog as a native species.
Conclusions on Uncertainty		MEDIUM -1	Uncertainty in this assessment stems from: i) incomplete information on the environmental impacts of the marsh frog; ii) because its future success is likely to be dependent on climate change (the responses of individual species to climate change are speculative); iii) there is a lack of information regarding the potential of this species as a vector of chytrid fungus and of the effects of this pathogen on native amphibians.

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